chip is outputted from said mounting substrate for use off of said mounting substrate,

said method comprising the step of:

driving said compensation circuit to compensate for a noise component included in a photo-electric conversion signal read out from said photo sensor chip output device by using a noise signal read out from said photo sensor chip output device.

REMARKS

This application has been reviewed in light of the Office Action dated September 11, 2002. Claims 8, 11, 14, and 33-38 are pending in this application, with Claims 33 and 38 being in independent form. Claims 1-7, 9, 10, 12, 13, and 15-32 have been cancelled, without prejudice or disclaimer of the subject matter presented therein. Claims 33-38 have been added to provide Applicants with a more complete scope of protection. Claims 8, 11, and 14 have been amended only as to matters of form, so as to depend from Claim 33. Favorable reconsideration is requested.

The Examiner has objected to drawings 1A, 1B, and 2 on the basis that they are prior art. Applicant has added the label "PRIOR ART" to these figures.

The drawings were also objected to because they included reference symbols ϕ_{BB}, ϕ_{N1}, ϕ_{CR}, V_{CHR}, 99, ϕ_{ERS}, and ϕ_{TT} not mentioned in the description. ϕ_{ERS} is described at page 4, line 2, and reference symbol 99 is described at page 16, lines 2-3 of the specification. Applicant has amended Figure 2, and the specification at page 3 to refer to

ϕ_{CR} as a reset signal for C_{TS} and C_{TN}. Applicant has also amended the Figures to remove references to ϕ_{BB}, ϕ_{N1}, V_{CHR}, and ϕ_{TT}.

The drawings were further objected to because reference numeral "13" had ambiguous usage in Figures 1A and 4A. Applicant has changed reference numerals 13 and 14 in Figure 1A to --13a-- and --13b-- , respectively, and 13 in Figure 4A to --15--. Applicant believes that all of the drawing objections have been obviated, and respectfully requests their withdrawal.

The Examiner objected to the title of the invention as not descriptive. Applicant has amended the title so that it is clearly indicative of the invention to which the claims are directed. Therefore, Applicant respectfully requests withdrawal of the objection to the title.

The Office Action also includes objections to the specification at pages 11 and 15. Applicant's amendments to the specification and drawings are believed to remedy these objections, and their withdrawal is respectfully requested.

The Office Action includes rejections under 35 U.S.C. §§ 101 and 112, but the cancellation of Claims 1-6 renders these rejections moot. Applicant submits that the newly amended and added Claims comply fully with Sections 101 and 112.

Claims 22-24, 26 and 32 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,321,528 (Nakamura). Claims 1-21, 25, and 28 were rejected under 35 U.S.C. § 103(a) as obvious over Nakamura in view of various combinations of U.S. Patent No. 6,301,712 (Miyazaki et al.), U.S. Patent No. 5,933,188 (Shinohara et al.), U.S. Patent No. 6,215,521 B1 (Surisawa et al.), U.S. Patent No. 4,780,765 (Hamasaki et al.), and U.S. Patent No. 4,965,570 (Hatanaka et al.). Applicant

respectfully traverses these rejections.

Applicant submits that independent Claims 33 and 38, together with the remaining dependent claims, are patentably distinct from the proposed combination of the cited prior art at least for the following reasons.

Claim 33 requires an image sensor including a plurality of photo sensor chips mounted on a mounting substrate, each photo sensor chip having a plurality of photo-electric conversion circuits, a common output line through which signals from said plurality of photo-electric conversion circuits are outputted, and a photo sensor chip output device which outputs signals from said common output line to outside of said photo sensor chip; and a correction circuit output chip mounted on the mounting substrate on which the plurality of sensor chips are mounted, said correction circuit output chip having a noise compensation circuit which compensates for a noise component included in a photo-electric conversion signal read out from the photo sensor chip output device, by using a noise signal read out through the photo sensor chip output device, wherein the correction circuit output chip is arranged commonly to said plurality of photo sensor chips, and an output signal from said correction circuit output chip is outputted from said mounting substrate for use off of the mounting substrate.

One important feature of Claim 33 is that the plurality of photo sensor chips are mounted on the same mounting substrate as the correction circuit output chip, and the output signal from the correction circuit output chip is outputted from the mounting substrate for use off of the mounting substrate. This feature is described in the specification at least at page 12, lines 1-3, and in reference to Figure 3, which states that "[t]he amplifier chip 200 has a single output terminal Vout. The output from this terminal

Vout is that of the assembly 300." In other words, the sensor chips 100 and the amplifier chip 200 are on the same mounting substrate 300, and any processing done with the signal Vout, is done off of the single mounting substrate 300. (It is to be understood, of course, that the scope of Claim 33 is not limited to the details of this embodiment, which is referred to only for purposes of illustration.)

At page 10, the Office Action states that Nakamura is silent with regard to including the sensor module on the substrate with the processing means, but that doing so would be obvious. Amended independent Claim 33 requires not only that the plurality of photo sensor chips be mounted on the same substrate as the correction circuit output chip, but also that any subsequent processing of the output of the correction circuit be done off of the substrate containing the plurality of photosensor chips and the correction circuit output chip. Applicant submits that Nakamura is also silent about this feature, and accordingly that Claim 33 is patentable over Nakamura.

Applicant submits that, at least for the reasons discussed above, the proposed combinations of Nakamura, Miyazaki et al., Shinohara et al., Surisawa et al., Hamasaki et al., and Hatanaka et al., assuming such combinations would even be permissible, would still fail to teach or suggest the plurality of photo sensor chips mounted on the same substrate as the correction circuit output chip, and the output signal from the correction circuit output chip outputted from the mounting substrate for use off of the mounting substrate, as recited in Claim 33. Accordingly, Applicant submits that Claim 33 is patentable over this prior art, taken separately or in any proper combination.

Independent Claim 38 is a method claim that corresponds to apparatus Claim 33, and is believed to be patentable for at least the same reasons as discussed above in connection with Claim 33.

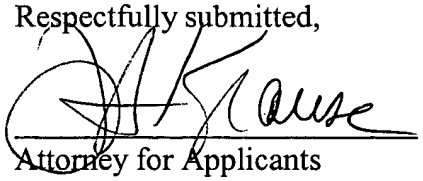
A review of the other art of record has failed to reveal anything that, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as applied against the independent claims herein. Therefore, those claims are respectfully submitted to be patentable over the art of record.

The other rejected claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual consideration or reconsideration, as the case may be, of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES
MADE TO SPECIFICATION AND CLAIMS

The title beginning on page 1, has been amended as follows:

--IMAGE SENSOR AND METHOD FOR DRIVING AN IMAGE SENSOR FOR REDUCING FIXED PATTERN NOISE--

Page 3, first paragraph has been amended as follows:

In Fig. 1A, the bipolar transistor 9 constructs a sensor portion of [an] a photo-electric conversion element. Each transistor 9 is connected to a MOS transistor 27 (28), MOS transistor 31 (32), capacitances $C_{TS}1$ and C_{TN} 2 which are reset by the reset signal ϕ_{CR}, and MOS transistor 25 (26), and the MOS transistors 25 and 26 of the respective bits are connected to the common output lines 3 and 4. Reference symbols C_{HS} and C_{HN} denote capacitances for the output lines 3 and 4. The output lines 3 and 4 are connected to the differential amplifier 33 via voltage-follower amplifiers 13a and [14] 13b.

Page 4, last paragraph has been amended as follows:

In order to reset holding capacitances C_{HS} 7 and C_{HN} 8, MOS transistors 5 and 6 are turned on by a signal ϕ_{HC}. After these capacitances are reset, the MOS transistors 25 and 26 are turned on by the timing signal ϕ_N output from a shift register (not shown). When the MOS transistors 25 and 26 are ON, data in the light signal holding capacitance $C_{TS}1$ and noise signal holding capacitance $C_{TN}2$

(some components of charges) are respectively transferred to the capacitances C_{HS}7 and C_{HN} 8, connected to the common output lines 3 and 4. Consequently, the potential that appears on the output line 3 (4) is determined by the ratio between the capacitances C_{HS} 7 and C_{TS} 1 (the ratio between C_{HN} 8 and C_{TN} 2). The potential on the output line 3 (4) is amplified by the differential amplifier 33 via an amplifier 13a [(14)] (13b).

Page 5, second full paragraph has been amended as follows:

By repeating such shift operation, the charges accumulated on the sensors (transistors 9) of the respective bits are read out to the capacitances C_{HS} 7 and C_{HN} 8. Voltages induced on the capacitances C_{HS} 7 and C_{HN} 8 are input to the differential amplifier 33 via the voltage-follower amplifiers 13a and [14] 13b.

Page 11, last paragraph has been amended as follows:

Fig. 3 shows the arrangement of an assembly 300 of a contact image sensor according to the first embodiment. In Fig. 3, the assembly 300 has a plurality of sensor chips 100, 100', 100'', ..., [100_n] 100^n, a pair of common output lines 101 and 102 from these sensor chips, and one amplifier chip 200. In principle, each of the sensor chips 100, ... has two output terminals, which are respectively connected to the common output lines 101 and 102. The two input terminals of the amplifier chip 200 are respectively connected to the common output lines 101 and 102. The amplifier chip 200 has a single output terminal V_{OUT}. The output from this terminal V_{OUT} is that of the assembly 300.

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

8. (Amended) The semiconductor device according to [claim 5] claim 33, wherein a power supply voltage of said [semiconductor device] correction circuit output chip is higher than a power supply voltage of said [semiconductor photosensor chips] photo sensor chips.

11. (Amended) The semiconductor device according to [claim 5] claim 33, wherein GND wiring for said [semiconductor device] correction circuit output chip and GND wiring for said [semiconductor photosensor chips] photo sensor chips are isolated from each other on said mounting substrate.

14. (Amended) The semiconductor device according to claim 8, wherein GND wiring for said [semiconductor device] correction circuit output chip and GND wiring for said [semiconductor photosensor chips] photo sensor chips are isolated from each other on said mounting substrate.